AN INVESTIGATION OF THE FACTORS AFFECTING THE COLLABORATIVE PROPENSITY OF HOME-BASED BUSINESSES: AN OUTLINE OF THE INITIAL STUDY

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Business collaboration is frequently used as a method for small businesses to maximise their chances of success in competitive markets, allowing as it does for a reduction in transaction costs and access to resources held by other businesses. Home-based businesses in particular stand to benefit from collaborative arrangements, owing to the typical scarcity of resources available to them. Despite the relative prevalence of collaborative behaviours exhibited by such businesses, very little research has been performed to study the factors which impact a home-based businesses propensity for collaboration. This positional paper presents an investigation into those factor using a "pre-collaborative" approach, using quantitative methods applied to the Global Entrepreneurship Monitor (GEM) data to discern commonalities present within the organisational, technological and environmental conditions of home-based businesses which display a collaborative inclination, to determine the underlying factors which predispose these businesses to the formation of collaborative relationships.

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Abstract

Business collaboration is frequently used as a method for small businesses to maximise their chances of success in competitive markets, allowing as it does for a reduction in transaction costs and access to resources held by other businesses. Home-based businesses in particular stand to benefit from collaborative arrangements, owing to the typical scarcity of resources available to them. Despite the relative prevalence of collaborative behaviours exhibited by such businesses, very little research has been performed to study the factors which impact a home-based businesses propensity for collaboration. This positional paper presents an investigation into those factor using a "pre-collaborative" approach, using quantitative methods applied to the Global Entrepreneurship Monitor (GEM) data to discern commonalities present within the organisational, technological and environmental conditions of home-based businesses which display a collaborative inclination, to determine the underlying factors which predispose these businesses to the formation of collaborative relationships.

Keywords: Home-based business, business collaboration, collaboration factors

1.0 Background to the study

A home-based business (HBB), while certainly a form of small-to-medium enterprise (SME) can more accurately be defined as "*any business entity…operated by a self-employed person…that uses residential property as a base from which the operation is run*" (Mason, Carter & Tagg, 2011, p.12). In line with the stance adopted by Clark & Douglas (2014), this broad definition extends to business based both 'at' and 'from' the home, including mobile businesses and those with no fixed premises. Within the OECD countries, over half of all small businesses are run either from or at the home

(Mason, 2010). Despite this, they remain an understudied sector, particularly with regard to their interactions with other firms. While the area of small-to-medium enterprise (SME) collaboration is well studied, little work has been performed on the topic of the collaborative behaviours of HBBs.

Given the challenging market conditions often facing small firms, a common step taken by such businesses is to combine their resources and working efforts (Knop, 2007) and as such these firms are seeking collaborative opportunities outside the boundaries of their organisation (Hudnurkar et al., 2014; Casals, 2011). While Hoffman & Schlosser (2001) reported that small firms were pointedly less likely to engage in collaborative behaviours, this is disputed by Robson & Bennett (2001) who argued that larger businesses are more likely to shun alliances while smaller businesses are more inclined to use alliances as a way of enhancing their resource holdings and market position. While figures on the exact proportion of SMEs engaging in collaborative activities are somewhat disputed, empirical findings show that the exhibition of collaborative behaviours is in fact common. Knop (2007) indicated that over 50% of European SMEs work collaboratively with others, while findings by Brunetto & Farr-Wharton (2007) provide a more specific figure, with results stating that 68.4% of surveyed SMEs participated in collaborative activities of some form.

Antonelli & Taurino (2011) highlighted three main strata of collaborative relationship among small firms. Firstly, ad-hoc, where the collaboration remains at the level of a conventional customer-supplier relationship; secondly, defined and linked, whereby collaboration occurs at an operational level and comprised of activities such as forecasting and procurement, and thirdly, integrated and extended, where the collaboration extends to coordinated strategies and assimilated enterprise activities. While collaboration is a frequent occurrence among small firms, these collaborative arrangements are most often located within the two former strata, and commonly arise from informal and unplanned relationships - stemming from geographic or market proximity - with few collaborative arrangements found to be structured or long-term in nature (Carneiro et al., 2013; Antonelli & Taurino, 2011). Further to this, Brunetto & Farr-Wharton (2007) divided collaborative relationships into just two categories: hard relationships, which involve interdependent firms participating in joint production and marketing ventures, and soft relationships, describing those

arrangements which consist solely of cost cutting measures such as the sharing of resources. For the purpose of this study, all forms of collaboration are treated as equal, regardless of their permanence or arrangement.

This paper describes the background and rationale to an exploratory, quantitative study based on Global Entrepreneurship Monitor (GEM) data which will investigate the factors affecting the inclination towards collaboration among HBBs located within OECD countries. This paper seeks to understand which conditions are required to establish a 'breeding environment' for collaborative relationships, and to explore the underlying structure of factors likely to indicate a propensity for collaboration.

2.0 The Associated Benefits of Small Business Collaboration

Engaging in collaborative activities with other businesses and building collaborative relationships has become an increasingly effective way for small businesses to meet the increasing performance requirements placed upon them (Carneiro et al., 2013, Casals, 2011). Due to this, business collaboration is frequently cited as a primary driver for sustainable success in the small business sector, from which businesses are able to derive numerous benefits. The existing literature describes a number of main areas from which these benefits can be derived via businesses' participation in collaborative activities: a reduction in transaction costs; access to new or larger markets; the ability to take on larger projects than would otherwise be feasible (via either production chain integration or improved production capacity) and access to resources currently outside the boundaries of the business.

According to Knop (2007), the primary rationale behind SME cooperation is access to new markets and the ability to supply to larger markets, in addition to improving their competitive position within such markets. In the majority of cases however, the primary driver of collaboration is the opportunity to leverage the hitherto unavailable resources held by another firm (Hudnukar et al., 2014). The most notable amongst these resources is knowledge, which through collaborative efforts can be both shared and created, to the mutual benefit of all parties involved (Carneiro et al., 2013; Antonelli & Taurino, 2011; Knop, 2007).

Fundamentally, through collaboration and the diffusion of knowledge, businesses are able to achieve a level of competitive advantage which would otherwise be unattainable (Crook et al., 2008; Brunetto & Farr-Wharton, 2007). Findings produced by Pouly et al. (2005), demonstrated that in business terms, collaboration is an overwhelmingly positive force, with the majority SMEs involved in collaborative activities being more successful than those which were not. Of those questioned, 82% responded that collaborative involvement had increased their competitive strength.

3.0 Research Design

3.1 Justification of the Study

The main research question motivating this study is what organisational, technological and environmental conditions possess the greatest impact on the collaboration inclination of HBBs? In addition, the study aims to identify and define the conditions favourable for the development of collaborative behaviours. To attain this understanding, the proposed research will undertake a data driven examination of the factors shared by OECD based HBBs which demonstrate collaborative inclination, to discover the common factors that exist between them. Confidence in the findings produced can be drawn from the diversity of the businesses used in the study, both in terms of geographic location and industry alignment.

3.2 Differentiation from Existing Studies

This study aims to differentiate itself from the existing research in the field on a number of levels. Firstly, through the explicit focus on HBBs: while there are a number of qualitative studies which have performed an investigation of the collaborative practices of SMEs, findings within the literature dealing solely with HBB collaboration are scarce at best.

Secondly, the majority of existing studies which focus on the collaborative activities of SMEs or HBBs concentrate on the performance factors which are found to contribute to successful collaboration. Carneiro et al. (2013), Brunetto & Farr-

Wharton (2007), Hoffman & Schlosser and Robson & Bennett (2001) detailed factors which emerge from collaborative relationships, and are thus based upon a 'post-collaborative' approach, in which collaborative arrangements are retrospectively analysed. The primary differentiator between this study and others is the adoption of a 'pre-collaborative' approach, in which the factors identified are intrinsic to those businesses which appear to display a predisposition to collaborative behaviour. Therefore this study aims to answer the 'why' question associated with collaboration, through the identification of characteristics common in collaborating HBBs, so that insight may be gained into which attributes and conditions produce an underlying propensity for collaboration.

Thirdly, unlike the majority of other examples found within the literature, this study utilises data from HBBs based in a number of countries, as opposed to using only data relating to businesses based in a single nation. In addition, this study uses a high dimensional dataset with records of approximately 3000 businesses from 20 OECD countries (Global Entrepreneurship Monitor, 2016). The resulting geographical diversity data richness and will allow for the findings to benefit from increased generalisability.

3.3 Overview of the Data

The study will be performed using data collected by the Global Entrepreneurship Monitor (GEM), a cross sectional repository of data on entrepreneurial businesses from across the globe, collected via a standardised survey. The study will utilise the 2012 release of the GEM dataset, due to the presence of year-specific questions relating to the collaborative practices of the businesses surveyed, not found in prior or subsequent versions of the dataset.

Knop (2007) stated that successful collaboration is dependent upon the environment in which it occurs. To this end, a number of environmental variables (shown in Table 1) will be used in this study. Moreover, the success of a collaborative relationship hinges on strategic, structural and cultural factors. The richness of the GEM data is therefore well suited to a study of HBB collaboration, as variables are present which represent all of these domains. The choice of using only those HBBs located within

OECD countries is intended to ensure relative parity in the economic environments of the businesses studied (OECD, 2008).

3.4 Identification of Variables

For the experimental phase of the study, a number of variables found within the GEM dataset will be used, describing both the organisational and environmental attributes of the businesses being studied, in addition to a selection of variables describing the personal attributes of the business owners. Within the literature however there is little research into the factors which result in a disposition for collaboration. Therefore this study will adopt an approach of utilising variables used in somewhat similar studies to establish an underpinning of continuity to previous work, allowing for comparisons to be made from the findings produced. Table 1 outlines variables used within prior studies which hold equivalents within the GEM dataset, and are therefore eligible for use within this study.

Variable	Study found in	Usage
Industry sector	Hudnukar et al. (2014)	Identified as variable affecting the transfer of information and knowledge between businesses
Market	Hudnukar et al. (2014)	Identified as variable affecting the transfer of information and knowledge between businesses
Competitive environment	Hudnukar et al. (2014)	Identified as variable affecting the transfer of information and knowledge between businesses
National culture	Hudnukar et al. (2014)	Identified as variable affecting the transfer of information and knowledge between businesses
Business size	Hudnukar et al. (2014)	Identified as variable affecting the transfer of information and knowledge between businesses
Technology level	Antonelli & Taurino (2011)	Used a variable to describe businesses in collaborative networks
Number of employees	Antonelli & Taurino (2011)	Used a variable to describe businesses in collaborative networks
Export percentage	Antonelli & Taurino (2011)	Used a variable to describe businesses in collaborative networks
Innovation effort	Casals (2011)	Identified as part of a systematic review as a reason for collaboration

Table 1. Variables used in other studies concerning collaboration which correspond to variables found within the GEM 2012 dataset.

Owing to the study being exploratory in nature the scope has been widened to include variables not commonly used in within the existing literature. This approach allows for factors not previously considered to be related to collaborative propensity to be included, thus allowing for a more expansive range of underlying trends and patterns to be identified through data mining techniques. This is made possible due to the richness of the data available through the use of the GEM dataset, therefore in addition to the variables shown in Table 1, a range of other variables found within the data will also be incorporated into the experimental phase of the study, bringing the total amount of variables to be used to 37. A full breakdown of the variables used can be found in Appendix A.

4.0 Future Work

The experimental phase of this study possesses the primary purpose of identifying which factors occur most often with HBBs which are known to exhibit collaborative behaviours. The study will utilise a data mining technique known as association rule mining, sometimes termed market basket analysis, to find commonalities within the data when the presence of previous or ongoing collaborative activities is used as a control variable. Figure 1 shows the stages involved in the usage of the algorithm.

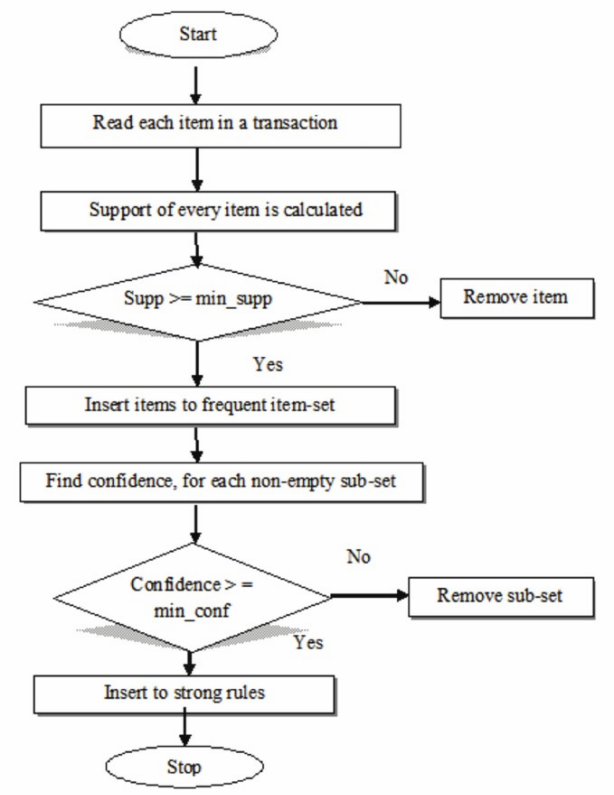

Figure 1. Flowchart of apriori algorithm stages (taken from Mandeep, 2014).

The key purpose of association rule mining is to determine frequent itemsets within the data (Hipp et al., 2000) thus detecting key trends and patterns which exist among the various attributes of HBBs which are engaged in collaborative activities. The primary method which will be applied is the apriori algorithm, a widely used and influential means of determining common relationships among variables in a dataset, known as rules.. Hahsler et al. (2005) outlined the three key principals of the apriori algorithm: support, confidence and lift. Support can be defined as the proportion of transactions (in this study, rows of data) within a dataset which contain a particular itemset (i.e. concurrent occurrences of the certain values). Confidence can be thought of as the likelihood of a rule being found to be true, while lift is a measure of variable interdependency. An example of the output generated via this process can be found in Appendix B. Together these four elements allow for the identification of the most prominent rules within a given dataset.

Through the use of this method, answers will be provided to the primary research question of identifying the factors, or combination of factors, with the greatest impact on the collaborative propensity of HBBs within OECD countries. These factors will later be used to develop a model to ascertain the optimum conditions HBB collaboration to occur.

Appendix A

Table 2 details the variables used within the study. All are binary variables, so as to allow their use in with the apriori algorithm. All variables names and descriptions are taken directly from the GEM 2012 dataset.

Variable Name	Variable Description
knowent	Do you know someone personally who started a business in the past 2 years?
suskill	Do you have the knowledge, skill and experience required to start a new business?
fearfail	Would fear of failure would prevent you from starting a business?
TechSector	Technology Sector
BUSyyJOB	Expected job growth >= 10 persons and >= 50 percent
BUSyyEMP	Any jobs now or in 5 years
BUSyyHJG	Expects more than 19 jobs in 5 years
busang	Have you, in the past three years, personally provided funds for a new business started by someone else?
occufull	Employed by others in full-time work
occupart	Employed by others in part-time work
occuself	Self-employed
occuseek	Seeking employment
occurd	Not working because I am retired or disabled
occustu	A student
occuhome	Full-time home-maker
SUB	Reports new start-up effort (independent or job)
SUBA	Actively involved in start-up effort
SUBO	Owner in start-up effort
SUBOA	Actively involved in start-up effort and owner
SUBOANW	Actively involved in start-up effort, owner, no wages yet
OMBABYX	Involvement in start-up, reclassified into own/managed young business
OMESTBX	Involvement in start-up, reclassified into own/managed est. business
BABYBUSOM	Manages/owns a business that is up to 42 months old
ESTBBUSM	Manages a business that is older than 42 months
ESTBBUSO	Manages and owns a business that is older than 42 months
SUBOANWC	Owning-managing business reclassified into setting up business
BUSOWN	Business owner of running business (not nascent)
TEAyyANY	Involved in TEA
TEAyyOP	Involved in TEA, opportunity
TEAyyNE	Involved in TEA, necessity
NE_ANYyy	Nascent entrepreneur Y/N
SUBOPPyy	Nascent entrepreneur, opportunity
SUBNECyy	Nascent entrepreneur, necessity
IntrapreneurYN	Active as an intraprenuer
IntraprenuerLDYN	Active and Leading as an intraprenuer
CollabIntense	Indicates intense collaborative activity
Collab	Takes part in any collaborative activities

Table 2. Variables from the GEM 2012 data used in the study

Appendix B

Table 3 displays an example output generated by application of the apriori algorithm on the GEM 2012 dataset. This preliminary test was performed as a proof of concept, and was limited to the use of just 5 variables, with a fixed dependent - or right hand side (RHS) - variable of "Collab", denoting the participation in collaborative activities. Variable labels can be found in Appendix A.

Left Hand Side	Right Hand Side	Support	Confidence	Lift	Count
Suskill, occuself, ESTBBUSM, BUSOWN	Collab	0.36	1.00	>1.00	1049
Occuself, ESTBBUSM, ESTBBUSO, BUSOWN	Collab	0.42	1.00	>1.00	1244
SUBA, SUBO, SUBOA, SUBOANW	Collab	0.25	1.00	>1.00	748
Occuself, ESTBUSM, BUSOWN, CollabIntense	Collab	0.27	1.00	>1.00	807

References

Antonelli, D. and Taurino, T. (2011) Identifying and exploiting the collaboration factors inside SMEs networks, International Journal of Networking and Virtual Organizations, 9(4), 382-402.

Brunetto, Y. and Farr-Wharton, R. (2007) The Moderating Role of Trust in SME Owner/Manager Decision-Making about Collaboration, Journal of Small Business Management, 45(3), 362-387.

Carneiro, L. M., Soares, A. L., Patricio, R., Azevedo, A. L. and de Sousa, J. P. (2013) Case studies on collaboration, technology and performance factors in business networks, International Journal of Computer Integrated Manufacturing, 26(1-2), 101-116.

Casals, F. E. (2011) The SME Co-operation Framework: a Multi-Method Secondary Research Approach to SME Collaboration, 2010 International Conference on E-Business, Management and Economics, IPEDR vol. 3, IACSIT Press, Hong Kong.

Clark, D. N. and Douglas, H. (2014) Micro-enterprise growth: Lessons from home-based business in New Zealand. Small Enterprise Research, 21(1), 82-98.

Global Entrepreneurship Monitor (2016) http:/www.gemconsortium.org, last accessed 2017/06/20

Hahsler, M., Grun, B., Hornik, K. and Buchta, C. (2005) Introduction to arules – A computational environment for mining association rules and frequent item sets, Journal of Statistical Software.

Hipp, J., Guntzer, U., Nakhaeizadeh, G. (2000) Algorithms for Association Rule Mining – A General Survey and Comparison, ACM SIGKDD Explorations Newsletter, 2(1), 58-64.

Hoffmann, W. H. and Schlosser. R. (2001) Success Factors of Strategic Alliances in Small and Medium-sized Enterprises – An Empirical Survey, Long Range Planning, 34, 357-381.

Hudnukar, M., Jakhar, S and Rathod, U. (2014) Factors affecting collaboration in supply chain: A literature review, Social and Behavioral Sciences, 133, 189-202.

Johannisson, B. (1987) Beyond process and structure: social exchange networks. International Studies of Management & Organization, 17(1), 3-23.

Knop, R. (2007) Success Factors of Strategic Networks of SME, International Conference on Economics and Management of Networks, Rotterdam.

Mandeep, M. (2014). Loss profit estimation using association rule mining with clustering, Management Science Letters, 5, 167-174.

Mason, C. (2010) Home based business: Challenging their Cinderella Status, Small Enterprise Research, 17(2), 104-111.

Mason, C.M., Carter, S. and Tagg, S. (2011) Invisible businesses: The characteristics of home-based businesses in the United Kingdom. Regional Studies, 45(5), 625-639.

OECD (2008), *OECD Factbook 2008: Economic, Environmental and Social Statistics,* OECD Publishing, Paris.

Pouly M., Monnier F., Bertschi D. (2005) Success and Failure Factors of Collaborative Networks of SME. In: Camarinha-Matos L.M., Afsarmanesh H., Ortiz A. (eds) Collaborative Networks and Their Breeding Environments. PRO-VE 2005. IFIP — The International Federation for Information Processing, vol 186. Springer, Boston, MA.

Robson, P. J. A. and Bennett, R. J. (2001) SME Growth: The Relationship with Business Advice and External Collaboration, Small Business Economics, 15, 193-208.